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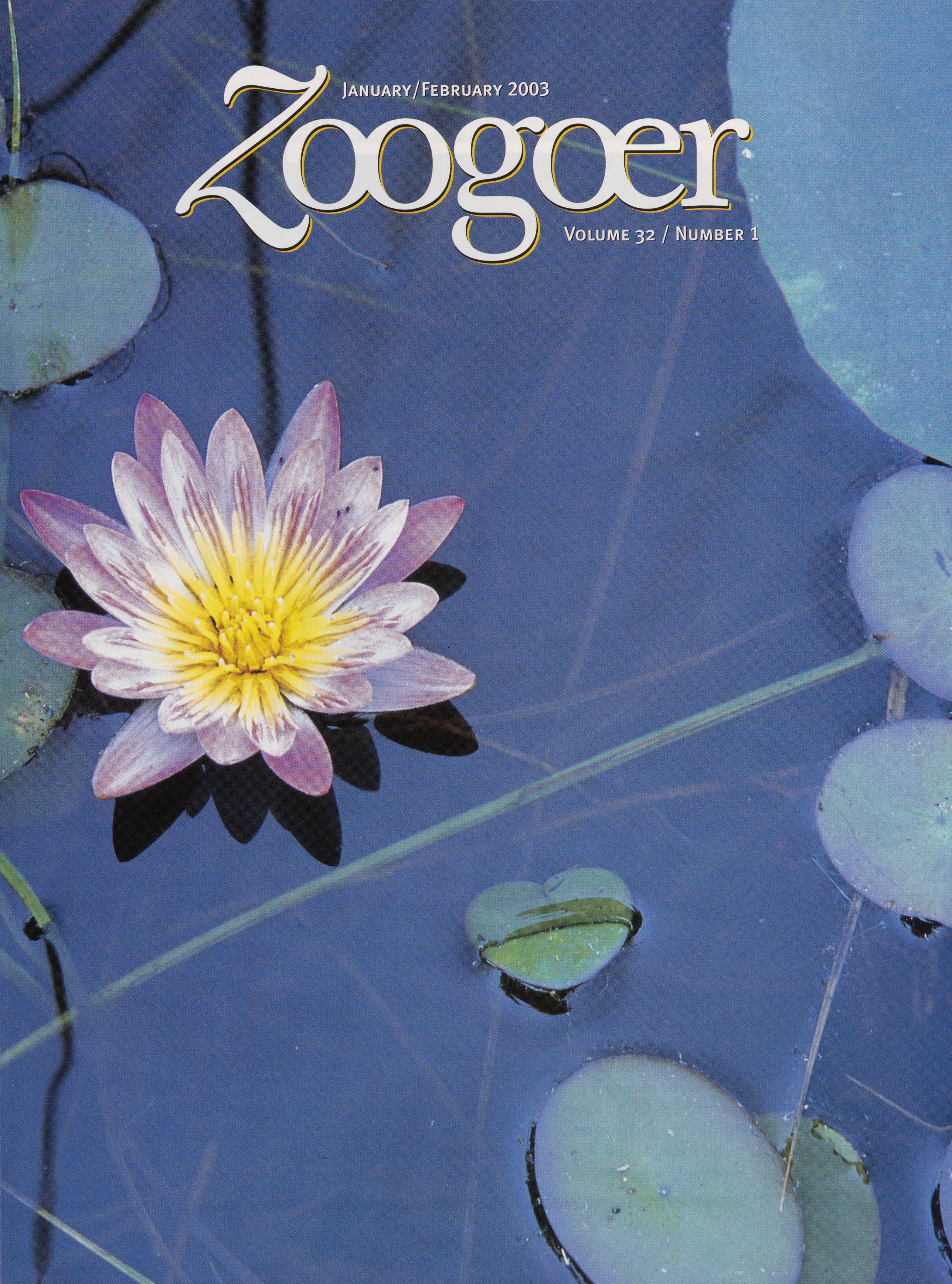

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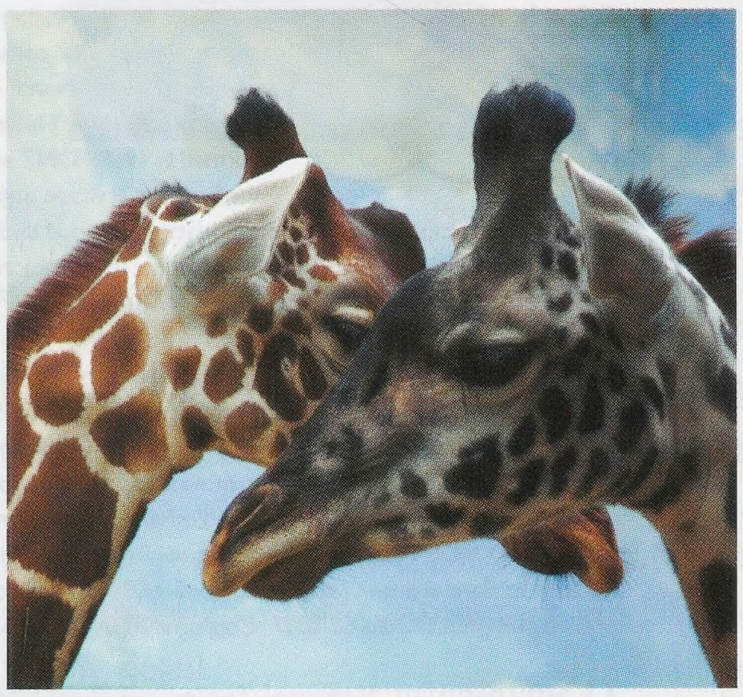

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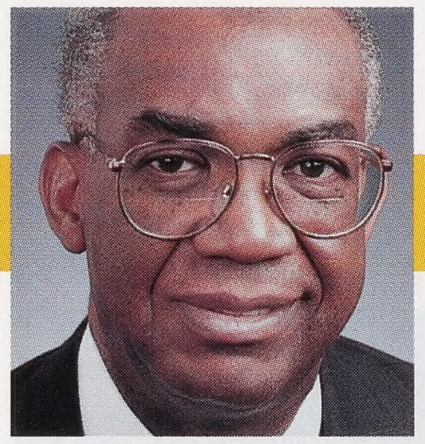

FONZ FORUM

A NEW ERA FOR FONZ

I joined Friends of the National Zoo 15 years ago. To mark that milestone, I recently read our 1987 annual report. It is hard to assess the magnitude of change when you review progress year by year. But looking at two snapshots, one taken in 1987, the other today, casts in stark relief the extent to which our organization has grown.

Then, as today, members and volunteers are the core of FONZ. In the last 15 years, the membership portion of that core has nearly doubled, growing from about 50,000 individuals to almost 90,000. Similarly, the number of volunteers doubled from 600 individuals contributing about 49,000 hours to 1,200 individuals contributing more than 92,000 hours of service.

Thanks to members and volunteers, our fundraising initiatives have blossomed, enormously increasing our support of the Zoo's mission. In 1987, FONZ conducted one fundraising event—National ZooFari—which hosted 400 guests and raised about $30,000. In 2001, ZooFari was catered by 100 of Washington's finest restaurants and attracted about 3,000 guests and raised $350,000. We also host two additional major fundraisers. Guppy Gala raised $50,000 in 2001, while the wildly popular Boo at the Zoo raised $128,000. And in 1987, FONZ had no development capacity, while in 2001, our development office counted $2 million in private, corporate, and foundation donations.

The other source of revenue to support the Zoo is concessions management—merchandise, food, and guest services. Gross concessions revenues have doubled from about $6 million in 1987 to more than $12.5 million in 2001. All told, FONZ provided about $4 million to the Zoo in 2001, up from less than $1 million in 1987—a stellar achievement that helps the Zoo improve exhibits, educate visitors, conduct valuable biological research, and contribute to the conservation of endangered species.

Contributing to growth in concessions revenues are new and updated facilities. In 1987, we opened the National Zoo Bookstore, our first full-service indoor shop. Since then, we've replaced all of our old, walk-up shops and added a National Zoo Store at Reagan National Airport. And in 1987, we didn't even imagine that there would be a National Zoo Store Online! We built a new food service facility at Panda Plaza and the renovated Mane Restaurant will open in the summer next to the new Picnic Pavilion.

Looking at what hasn't changed reveals our consistent support for important programs. For instance, then as now, FONZ was helping to fund the golden-lion-tamarin conservation program, which is credited with saving this species from extinction.

In 1987, FONZ volunteers also conducted an around-the-clock Panda Pregnancy Watch to observe the births of Hsing-Hsing's and Ling-Ling's twins that year (both died soon after birth). Now, we are looking forward to repeating a watch should Tian Tian and Mei Xiang mate in the spring.

Our commitment to training scientists and conservationists has also been unwavering. With FONZ support, students trained by Zoo staff have gone on to fill the most senior ranks of zoos, government wildlife departments, non-government conservation organizations, and universities around the world.

On the lighter side, popular events, like Seal Days (now known as "North American Wildlife Celebration"), ZooNights and Summer Safari Camp, began well before 1987. But since then, we've added special events like Fiesta Musical and Focus on Science Weekend, an overnight camp at the Zoo's Conservation and Research Center, Snore & Roar sleepovers at the Zoo, and After-Hours parties for our Young Professional (YP) members.

Wow! It's been an exciting 15 years. I suspect the next 15 will be more exciting yet, as the entire Zoo is renewed to better meet the needs of our animals, our visitors, and our staff. We will need your help to make the National Zoo the best zoo in the world, and to do our part to help protect the world's wild animals and their habitats.

Thank you for your continued and generous support.

Clinton A. Fields
Executive Director

Friends of the National Zoo is a non-profit organization dedicated to supporting the conservation, education, and research efforts of the Smithsonian's National Zoo. Formed in 1958, FONZ was one of the first conservation organizations in the nation's capital. Friends of the National Zoo is dedicated to supporting the Smithsonian's National Zoo in a joint mission to study, celebrate, and help protect the diversity of animals and their habitats.

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Smithsonian ***National Zoological Park*** is located at 3001 Connecticut Ave., N.W., Washington, DC 20008-2537. Weather permitting, the Zoo is open every day except December 25. Hours: From May 1 to September 15, grounds are open from 6 a.m. to 8 p.m.; buildings, 10 a.m. to 6 p.m. From September 16 to April 30, grounds are open from 6 a.m. to 6 p.m.; buildings, 10 a.m. to 4:30 p.m.

Membership in FONZ offers many benefits: publications, discounts on shopping, programs, and events, free parking, and invitations to special programs and activities to make zoogoing more enjoyable and educational. To join, write FONZ Membership, National Zoological Park, Washington, DC 20008, call 202.673.4961 or go to www.fonz.org.

Membership categories and annual tax-deductible dues are:

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Individual	$39
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Cover photo: Okavango lily on pond. Photo by Katherine Baldwin

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LETTER FROM THE ZOO DIRECTOR

Dear ZooGoer:

All kinds of fascinating things go on behind the scenes at the National Zoo. In my view, zoogoers should know all about the "hidden zoo": how the Zoo works, who makes it work, and how we pay for all of this work. A key element of the hidden zoo is the FONZ Grant Program. Many zoogoers are familiar with the program, but I would like to give all of you a bit more detail.

The FONZ Grant Program provides a significant sum of money—about half a million dollars per year—to the Zoo Director to administer a small-grants program for research, conservation, public outreach, and professional training. FONZ Grant funds, which come from the net income of Zoo concessions, support projects like golden lion tamarin interpretation and reintroduction, black-footed ferret reproductive-biology studies, and the Zoo lecture series. It also supports professional training in many disciplines. Our summer trainees, who spend about three months here, and senior trainees, who are here for a year or more, study everything from behavior and reproductive biology to zoo videography, horticulture, and veterinary medicine. Zoo staff submits proposals for this program to the Director.

During the last three budget years, I have made three changes in how the Zoo administers the FONZ Grant Program. First, I have required that all submissions for these funds be made as part of the Zoo's annual budget cycle, which begins in October of each year. The reason for this change was to ensure that the Zoo staff applies these funds to our top-priority needs that cannot be funded in any other way. Every year as we plan our budget, we consider all sources of funds—federal, trust (for example, Zoo endowments), and private funds raised by the National Zoo, FONZ and the CRC Foundation. We ask everyone to prioritize their needs based on what must be done to care for the animals, followed by everything else we want and hope to do each year. We then work to match the most appropriate type of funds to the need, across all aspects of Zoo operations. We apply FONZ Grant funds where they make the best match: for traineeships as well as for programmatic support for research, conservation, and public programs. The great value—and power—of the FONZ Grant Program is better realized with this process.

The second change I made was to raise the stipends and include medical benefits for trainees spending a year or more with us at the Zoo, both at Rock Creek and CRC. While we all appreciate the willingness of young professionals to work hard for less money, the small stipends plus lack of medical benefits placed a hardship on those willing to dedicate two or even three years to Zoo service. In addition, many of our trainees work closely with the animal collection, and ensuring health coverage for them was important to me.

The third change I made was to reserve about one half of the FONZ Grant Program funds for research, conservation, and education projects, and the other half for the trainees. In 2003, we have seven FONZ senior trainees and eight summer traineeships funded. Moreover, all of our priority science, and education programs are funded in 2003. You can also find more information on our website at http://nationalzoo.si.edu.

Our senior trainees in 2003 are Carlos Sanchez, veterinary resident; Kitty Enquist, pathology resident; J'nie Woosley, photographer; Stacey Tabellario, videographer; Joan Haley, wildlife conservation management trainer; Dawn Smith, architect; and Frederick Field, Amazonia science outreach. The summer traineeships in 2003 will be in the following areas: information, veterinary medicine, behavior, pathology, graphic production, horticulture, and photography.

You may be wondering why I have made the distinction between the programmatic side and the people side of the FONZ Grant Program in terms of dividing the funding, and why I wanted to point it out in this letter. For me, it is a top priority that we continue to support professional development, even as our budgets tighten year to year. I feel strongly—and Zoo senior staff agrees—that we must continue our commitment to supporting trainees even as our list of unfunded science and education programs grows longer. This is, in part, personal.

My zoo career started with the FONZ Grant Program. In the summer of 1985, between graduating from Brown University and moving to California to begin my veterinary career, I spent three months at the Conservation and Research Center in Front Royal as a FONZ Grant summer trainee in animal husbandry. My job—along with one other intern—was to help collect behavioral data on the herds of Pere David's deer, while also helping with daily zookeeping chores. I remember spending hours sitting quietly in the pastures watching and recording what we called "horning and adorning" among the males of this species. For zoogoers who are not familiar with this behavior, this is the way the Pere David's deer males make themselves irresistible to females and more challenging to each other: by flinging mud and plant material all over their antlers. Of course, deer have antlers, not horns, but the rhyme was more important at the time.

I hope in the next year some of you can get to know our current group of FONZ Grant trainees, as well as the many important projects the program supports. Like so much of what goes on at the Zoo, the program would not be possible without your support.

Sincerely,

Lucy H. Spelman
Director
Smithsonian's National Zoological Park

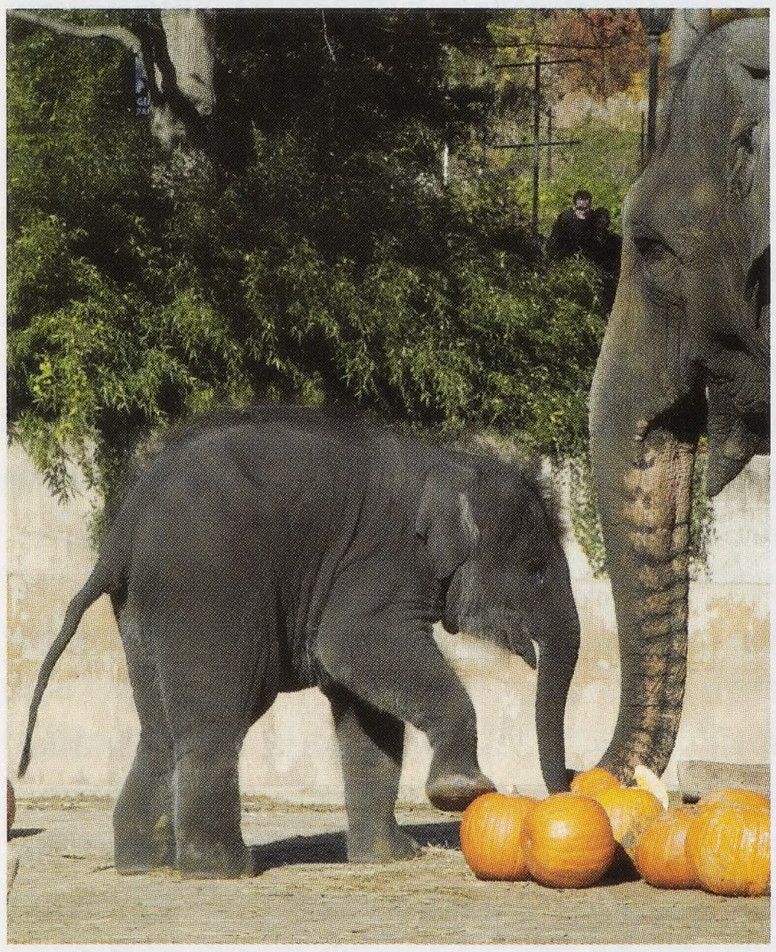
NOTES & NEWS

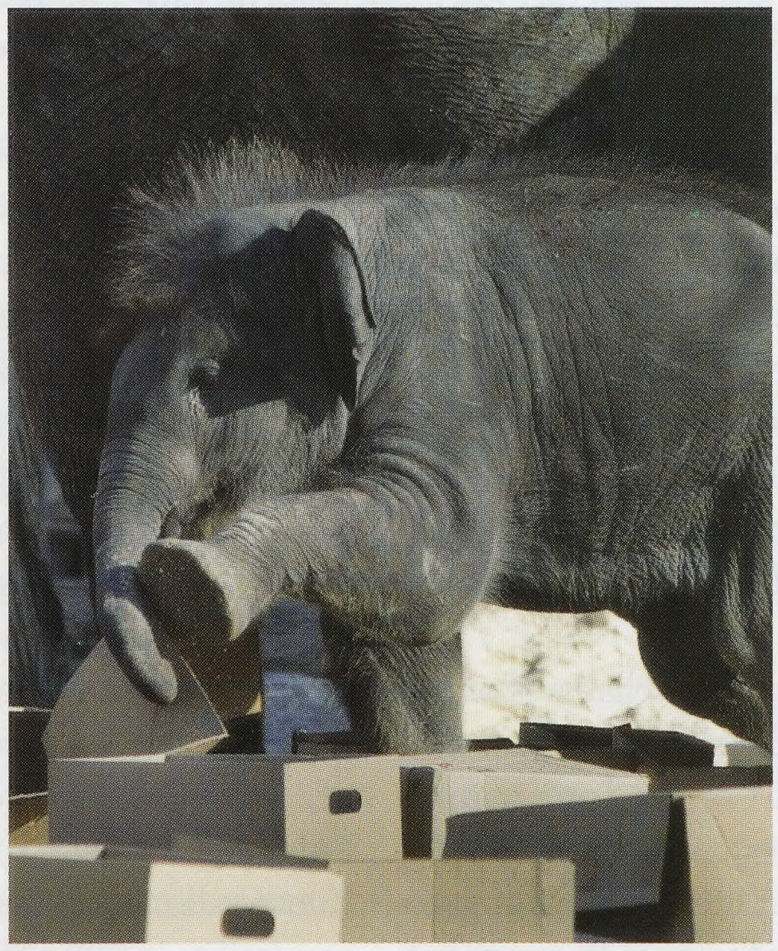
ANIMAL NEWS

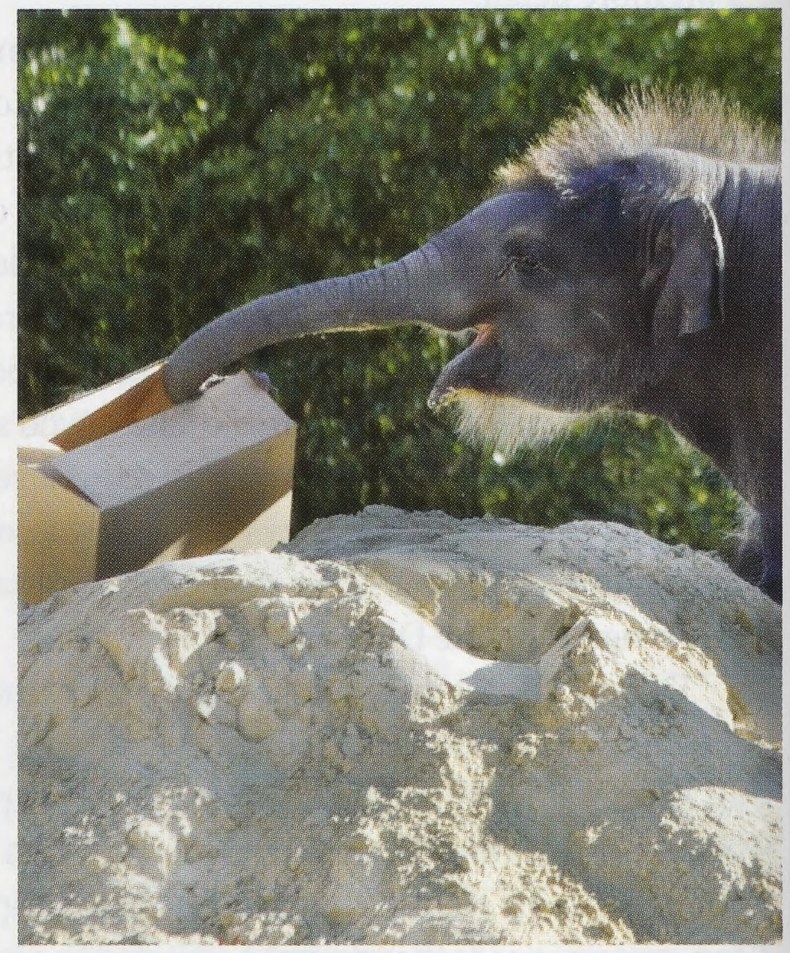
On November 16, Zoo visitors were treated to a popular annual animal-enrichment activity known as Pumpkin Stomp. As part of the Zoo's enrichment program, this activity provides novel foods and tasks to animals, and gives animal participants a chance to investigate something different, get some exercise, and have interesting variety in their diet. Various Zoo animals got into the act, including elephants, gorillas, and orang utans—a stomping good time was had by all. Local farmers Ben Allnut, Justin Stalcup, and Bonnie Ruetenik donated leftover pumpkins for this delicious demolition.

Pumpkins were not the end of the romping and stomping—or press days—for Kandula, however. He also celebrated his first birthday in November. His keepers, rather than experience the disappointment of giving a one-year old presents, only to have him play with the boxes, went straight for the boxes. The half ton bull-in-the-making made short work of the carefully arranged stack of boxes and seemed to delight in its destruction.

The birthday boy now weighs about half a ton, stands over four feet tall, and recently lost his first "baby" tooth. He is also slowly getting to know Ambika and Toni, with whom he must establish a good relationship before he and Shanthi can spend unsupervised time with them.







JESSIE COHEN / NZP

J'NIE WOOSLEY / NZP

WINTER ACTIVITIES

An impressive new presence now oversees zoogoers and passersby at the Connecticut Avenue pedestrian entrance to the Smithsonian's National Zoo: a pair of 5,000-pound bronze-lion sculptures. This step in Zoo Director Lucy Spelman's ten-year Zoo renewal plan features new gates, new paving, and these fully maned lion figures, which stand 12-feet tall and flank the renovated entrance. These improvements were made possible by an anonymous donation to FONZ.

The figures were originally cast in concrete by Roland Perry in 1906 and placed in pairs at either end of Woodley Park's Taft Bridge. It was not until their replacement in 2000 that the Zoo director and artist Reinaldo López-Carrizo met and decided that bronze lions should grace the Zoo's entrance.

Woo at the Zoo—a FONZ celebration of couples—will again be held Valentine's Day, Friday, February, 14 from 7 p.m. to 10 p.m. Zoo experts will be on-hand to discuss the birds and the bees of small mammals, big cats, and monkeys. Members can purchase tickets to this amorous event for $150 per couple ($200 per couple for nonmembers) and attendees can choose the Devoted Dart-Frog Tour through Amazonia and Small Mammals, or the Naughty Nautilus Tour of Invertebrates and Great Cats. For more information, go to http://nationalzoo.si.edu.

FONZ is offering more members-only, behind-the-scenes tours in February and March. Such tours of the Zoo's work areas give members a chance to see what it takes to care for animals from all over the world and provide a glimpse of how the Zoo's staff administer medical care, feed, and study animals in our collection. Availability is limited so register early; participants must be eight years or older and those under 16 must be accompanied by an adult. There will be Invertebrates tours on February 1 and 2; on March 1 and 2, it's off to the Bird House. All tours occur from 9:30 to 10:30 a.m. and attendees can choose Saturday or Sunday morning tours.

VOLUNTEER CORNER

The FONZ Volunteer recruitment season is fast upon us, and the Department of Education and Volunteer Services is looking for volunteers for the Reptile Discovery Center, the Invertebrate Exhibit, the Cheetah Conservation Station, and the Elephant House. Typically, volunteers must be able to commit to three, three-hour shifts a month for a year, plus monthly meetings, and five to seven days of initial training. (Specific program requirements vary.)

Reptile Discovery Center volunteers will be selected based on a strong interest in reptiles, amphibians, and education, and on good communication and interpersonal skills. Volunteer duties include talking with visitors, answering questions, assisting with interactive exhibits, narrating and conducting feeding demonstrations, and other activities that help the National Zoo share with visitors its mission to celebrate, study, and protect animals and their habitats. For more information and for the times and dates of training, please contact Bob Cmarik at 202.673.4874 or bob@fonz.org.

Invertebrate Exhibit volunteers are also needed to help Zoo visitors explore the complex and fascinating world of invertebrates, including corals, crabs, ants, anemones, seashells, and spiders. Volunteers talk with visitors, help with interactive exhibits, conduct feeding demonstrations, and other activities that help the Zoo share with visitors the thrill of experiencing wildlife firsthand. Interpreters also staff the Pollinarium, a greenhouse home to butterflies, bees, and hummingbirds, where displays and graphics illustrate plant reproduction via pollination. Applicants should have a strong interest in invertebrates and good communication skills. For further information, please contact Bob Cmarik (above).

J'NIE WOOSLEY / NZP

JANA, A MASAI GIRAFFE (*GIRAFFA CAMELOPARDALIS TIPPELSKIRCHI*) AND MALAIKA, THE ZOO'S NEW RETICULATED GIRAFFE (*GIRAFFA CAMELOPARDALIS RETICULATA*) ARE NOW ELEPHANT HOUSE-MATES.

Volunteers at the Cheetah Conservation Station share their knowledge of cheetah ecology and conservation, often using objects that illustrate the cheetah's physical characteristics, behavior, and ecology. Interpreters also speak to groups and narrate the actions of Zoo staff as they conduct animal-care and enrichment activities. Volunteers also share with visitors the natural history of zebras, gazelles, and crowned cranes, species that are also housed at the Cheetah Conservation Station and are cheetah neighbors in the wild, as well. Special qualifications include a strong interest in cheetahs, a desire and ability to talk to a wide variety of people, a willingness and ability to use a microphone to speak to crowds, and the ability to be outdoors in a variety of Washington weather conditions. Volunteers generally work from April through mid-November, but the program may be extended if the weather is good. Please e-mail Pam at pam@fonz.org for more information.

Elephant House interpreters share with visitors the natural history, conservation status, and Zoo management of elephants, hippopotamuses, rhinoceroses, and giraffes in a largely conversational manner. After a year in this program, volunteers may apply for open positions as Elephant Demonstration Narrators. These positions require microphone skills and the flexibility to follow and narrate live activity. A strong interest in these species, a desire and ability to talk with a wide variety of people, and a tolerance for being outdoors in hot summer weather are needed. Please e-mail Caroline at caroline@fonz.org for more information.

FONZ is also looking for Outreach volunteers to promote membership in FONZ and share with potential members the goals and activities of our Zoo support organization. As an Outreach volunteer, you will inform prospective members about the benefits of FONZ membership, such as free parking, discounts, publications, classes for children and adults, and national and international trips. Volunteers also staff a display next to the giraffe exhibit in the Elephant House during regularly scheduled weekend shifts, as well as on the Great Meadow or Lion/Tiger Hill during fall and spring special events. The display is also exhibited at some of the region's fairs and functions, such as the Fairfax Fair, the Black Family Reunion, and the Alexandria Waterfront Festival. Outreach volunteers should have strong communication skills and an enthusiasm about the mission of FONZ and the National Zoo. In most cases, volunteers provide their own transportation to Outreach events. For more information and details on training dates and times, please contact Lois at 202.673.4671 or lois@fonz.org.

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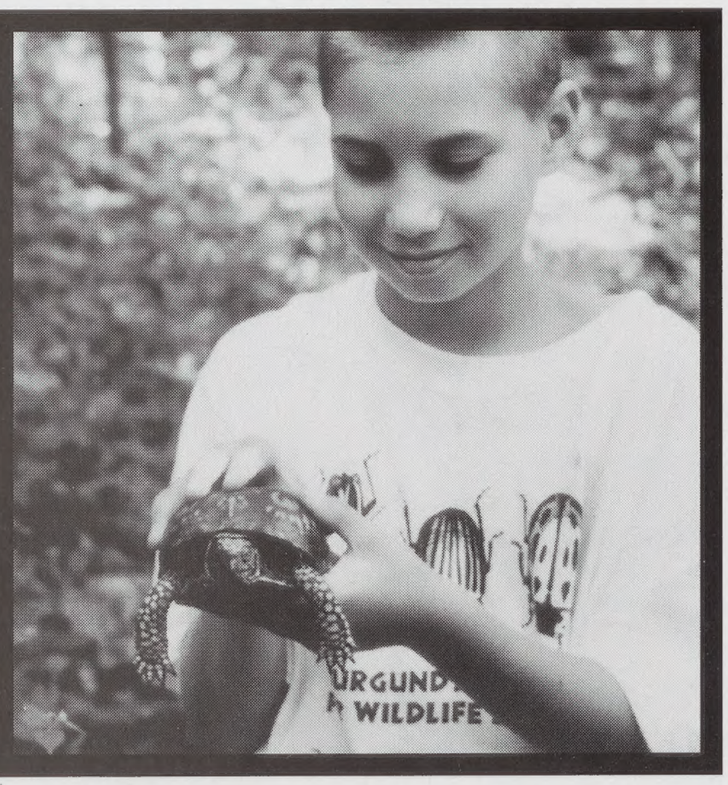


BY MILES ROBERTS
AND
PALMER GRAHAM

OKAVANGO: THE

River that Never Finds the Sea

PHOTOGRAPHS BY
KATHERINE BALDWIN

ZEBRAS (*EQUUS BURCHELLI*) GRAZE DRIED GRASSES AT A FOREST/GRASSLAND "EDGE" HABITAT ON PERMANENT HIGH-GROUND. EDGES ARE THE MOST PRODUCTIVE HABITATS IN THE DELTA AND PROVIDE ABUNDANT FOOD AND COVER FOR PREY AND PREDATORS ALIKE.

As our ten-seat turboprop hummed along in the shimmering heat, a bataleur eagle floated silently skyward on an invisible column of air, the gray sands of the Middle Kalahari receding slowly beneath its eagle-eye. Two thousand feet below, an inhospitable wasteland scrolled by, dried and worn to its core by the elements; an expanse of vast dry pans, cracked and crusted white with alkali; an endless wilderness of sandy flats dotted with stubborn thorn trees and leafless baobabs. No rivers flowed here, no lakes or mountains or valleys broke the flat monotony of the parched landscape for hundreds of miles around. Just sand and scrub and heat and wind.

MILES ROBERTS / NZP

SCHEMATIC DIAGRAM OF THE SOUTHERN CONTINENTS AS THEY MAY HAVE LOOKED 170 MILLION YEARS AGO, SHORTLY AFTER THE BREAKUP OF THE GONDWANALAND SUPERCONTINENT.

The dry savanna and desert that sprawled endlessly below us, known as the Kalahari, was born some 170 million years ago when Africa separated from the supercontinent Gondwanaland. A ring of escarpments marks where it calved from the adjoining landmass. At its center is an elevated plateau that subsided to form a huge interior basin that accumulated sediments, which would ultimately become the Kalahari sands. For a million centuries, tumultuous geological processes twisted the landscape while a thousand climatic cycles of dry and wet, hot and hotter scoured its face. We could see the weathered scars of wetter times, when rivers flowed into the central basin carrying water and fertile sediments to vast inland lakes. We could also see where, with progressively drying conditions,

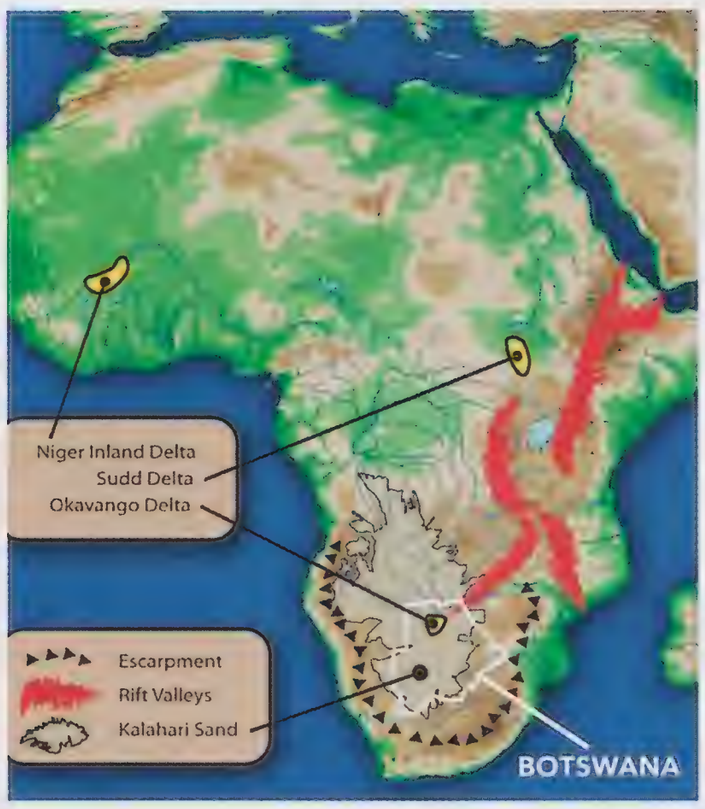
ISLAND HABITATS LIKE THE ONE IN THE BACKGROUND ARE OFTEN INITIATED BY TERMITE MOUNDS (FOREGROUND).

the rivers ceased to flow, lakes receded and dried to crusty pans, and the fertile soils, weathered by water and dry Kalahari winds, devolved to sand. "How can there be animals here?" we wondered. "There's not a drop of water to be seen."

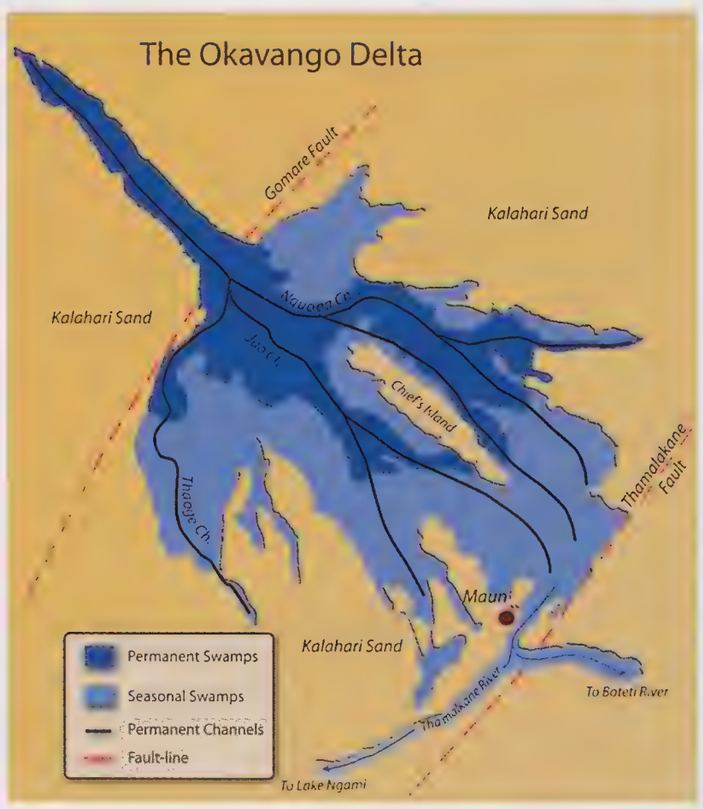
In the local Tswana language, "Kalahari" means "the big thirst," an apt sobriquet for a land dominated by dust, sand dunes, searing heat, and meager rains. But in a remote corner lies a strange and mysterious place where rivers still flow and permanent water supports an abundance of life. A magical air pervades this unlikely oasis, eminating a palpable sense that the gods are still at work, tinkering with the landscape. It is a place where rivers change course without apparent reason and extinct lakes suddenly fill, then, like a dream, evaporate, unremembered. Here, vast undulating sandscapes float atop an underground sea, sand dunes and verdant rivers flow side-by-

BELOW: WARTHOGS (*PHACOCHOERUS AETHIOPICUS*) ARE PERMANENT, NON-MIGRATING RESIDENTS IN THE DELTA AND THE FAVORED PREY OF LEOPARDS.

RIGHT: PERIPATETIC BABOONS (*PAPIO* SP.) AND ELEPHANTS (*LOXODONTA AFRICANA*) ARE THE DELTA'S MAJOR DISPERSERS OF THE SEEDS OF PALMS AND OTHER LARGE TREES.



MILES ROBERTS / NZP



MILES ROBERTS / NZP

FROM TOP: THE OKAVANGO DELTA IS ONE OF THREE INLAND DELTAS ON THE AFRICAN CONTINENT AND IS SOUTHERN AFRICA'S LARGEST WETLAND.

AFTER ENCOUNTERING THE GOMARE FAULT, THE OKAVANGO RIVER DIFFUSES ACROSS KALAHARI SANDS AS AN ALLUVIAL FAN FLOWING SOUTHEAST TOWARD MAUN.

MEANDERING CHANNELS OF THE LOWER DELTA STRETCH TOWARD THE HORIZON IN THE PRE-FLOOD SEASON.

side into a seemingly lifeless desert, and a river, born in distant highlands near the sea, snakes a thousand miles inland to create this oasis before evaporating into the vast African sky. This was our destination: Botswana's Okavango Delta, the place "where the river never finds the sea."

Our group of six from Washington, D.C., had come here for three weeks to experience one of the last great wildlife spectacles in Africa. For a year, we read as much as we could, but we didn't really know what to expect. Only one of us had been here, years before; two others had been to Africa, but never this far south, and the other three were completely new to Africa. Rumbling along in anticipation, we were thrilled when the first glistening ribbon of Okavango Delta water came into view.

The Okavango is southern Africa's largest wetland, spreading some 5,800 square miles across the heart of the Central Kalahari Basin. It is one of three large inland deltas in Africa, the Sudd, straddling the Nile in southern Somalia, and the Niger Inland Delta along the Niger River in Mali being the others. Technically called alluvial fans, all occur in arid areas where rivers encounter depressed fault-line structures that cause their flow to spread laterally in a fan-like pattern, creating a mosaic of dry land, marsh, and swamp habitats. They all support large assemblages of plants and animals that seem out of place in the harsh, arid environments.

The Okavango's water originates a thousand miles away in the Angolan Highlands. Spring rains there, peaking in December, send a pulse of water on a long, slow journey south and east. The river enters Botswana near the village of Mohembo in a somewhat restless state, its meanderings creating new channels, oxbow lakes, and lagoons each year. About 60 miles into Botswana, the river divides into three channels that progress at much reduced rates and in

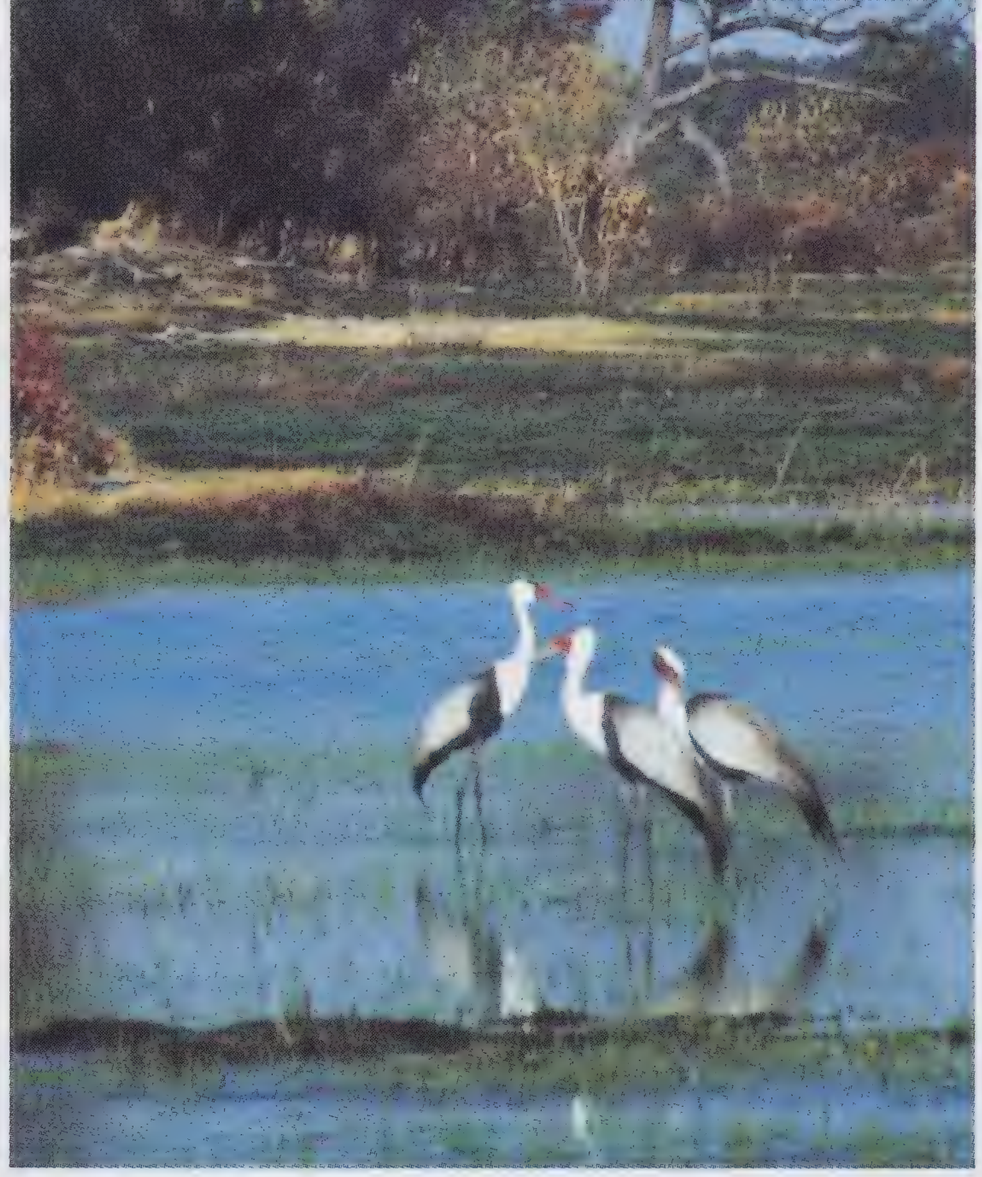
DURING ITS LONG JOURNEY, THE WATER IS SLOWED AND DIVERTED BY VEGETATION AND TOPOGRAPHIC IRREGULARITIES. IN ITS 155-MILE JOURNEY, ABOUT 98 PERCENT OF THE SURFACE WATER IS LOST THROUGH EVAPORATION AND PLANT TRANSPIRATION.

different directions. In the delta's upper reaches, water is contained in these major channels and flows between permanent strips of land called sandveld tongues. This perennial wetland is river-like and only during the annual floods does water leak from the channels into surrounding plains to form seasonal marshes.

AFRICA'S DELTA WILDERNESS

A sudden change in the engines' tune signaled the approach to our first destination. We quickly spiraled down to an airstrip very much in the middle of nowhere. The engines revved impatiently as the crew offloaded us and our meager possessions, then the plane wheeled off, it's dusty wake coating us with a fine layer of dust that would be our second skin for the next 21 days.

As the plane taxied to the strip, we looked around hoping to get our bearings, but the sun was at high noon and the landscape disconcertingly featureless. The turboprop roared by, sending up a flock of birds and another cloud of dust before soaring into the blue and leaving us alone and in silence. We were really in the African wilderness now.



THREE ENDANGERED WATTLED CRANES (*BUGERANUS CARUNCULATUS*) FORAGE FOR AQUATIC INSECTS ON AN OXBOW LAKE NEAR VUMBURA IN THE NORTHEAST DELTA. THE OKAVANGO DELTA IS AN IMPORTANT STOPOVER AND DESTINATION FOR MANY MIGRATORY BIRDS.

This first stop was at the tip of a permanent sandveld tongue within a few miles of the delta's apex. Here, the main channels begin to divide into progressively smaller streams that feed the lower reaches of the delta. The lower streams have porous walls that allow water to leak out across the terrain in wide swaths. Mixed with overflows from adjacent small channels, they form the large marshes with small high mounds that become the characteristic islands of the middle and lower delta.

Floodwater arrives at the southern end of the delta in July and August, a full five months after peaking at Mohembo. During its long journey,

WILDEBEESTE AT ALERT ON HIGH GROUND NEAR SANTANTADEBE CHANNEL IN THE SOUTHEAST DELTA. WILDEBEEST NUMBERS HAVE DECLINED DRAMATICALLY IN THE DELTA SINCE LIVESTOCK FENCES WERE ERECTED IN THE MID-1950S.

LECHWE (*KOBUS LECHE*) CAUTIOUSLY APPROACH A WOODED COPSE. (LEFT)PREDATORS ABOUND IN THE DELTA AND GRASSLAND-FOREST MOSAIC HABITATS SUCH AS THIS ONE ARE THE PERFECT SETTING FOR AN AMBUSH BY WILD DOGS OR LIONS.

THE OFFSET BETWEEN FLOOD AND RAIN CYCLES MEANS THAT WATER COMES TO THE OKAVANGO DELTA FROM RAINS BETWEEN DECEMBER AND MARCH AND FROM THE FLOOD BETWEEN MAY AND AUGUST.

the water is slowed and diverted by vegetation and topographic irregularities. In its 155-mile journey, about 98 percent of the surface water is lost through evaporation and plant transpiration.

About three-quarters of the Central Kalahari Basin's water comes from the Angolan Highlands; local rains, falling from November to March, provide the rest. Local rains recharge pools, mud holes, wallows, and even fill two vast nearby pans, or basins. Each year, the water refreshes the landscape and brings food to millions of migrating flamingoes, spoonbills, shorebirds, waterfowl, and their predators. As we drove from the airstrip to our lodgings, we saw one waterhole completely dried out except for a small muddy pool at the center. Scores of trapped catfish were being relentlessly picked off by a mob of maribou storks. "Like fish in a barrel," someone said—in a few days the waterhole would be submerged in floodwater—"timing is everything."

The offset between flood and rain cycles means that water comes to the Okavango Delta from rains between December and March and from the flood between May and August. Rains in the surrounding savanna forests generate a flush of vegetation that is more nutritious than the delta's coarse dry-season grasses. Superior food and abundant rainwater in the small pans and waterholes of the savanna-woodlands draw many large hoofed mammals, or ungulates, away from the delta for much of the dry season, but as savanna forage declines and its surface water evaporates, these same animals drift back toward the permanent waters to await the flood.

We had come to the Okavango to see the ungulates and their predators returning to permanent water. We quickly fell into an easy pattern of rising before first light, throwing on our warmest and cleanest clothes, gulping a cup of coffee, piling into open vehicles, and racing off across the rutted landscape for four or five hours of wildlife tracking. We would return in the late morning to siesta through the midday heat then head out again for another four or five hours, often returning after eight at night and always after watching a spectacular sunset in a smoke-tinged sky.

We were here at the height of the dry season, a time of fire when about 75 percent of the Okavango Delta's vegetation literally goes up in smoke. Hunters or cane collectors start most of the fires, but they are small, localized, and of little threat to wildlife. Occasionally, however, hot, gusting winds fan small blazes into huge conflagrations that leap across channels and wetlands and quickly consume hundreds of acres of vegetation. Aboveground fires travel rapidly and burn out quickly, but ignited peat beds can smolder for months and even years. Although destructive, fires stimulate a flush of new, nutritious vegetation just when ungulates need it most.

FEMALE LIONS (*PANTHERA LEO*) ARE ALWAYS ALERT FOR PREY. THIS ONE CAREFULLY SCRUTINIZED A SMALL GROUP OF ZEBRAS FOR SEVERAL MINUTES BEFORE REJOINING HER SLEEPING PRIDE.

LIVING AT THE EDGE

We moved around the delta by plane, spending three or four days in different habitats. The delta consists of three broad ecological zones based on the amount and persistence of locally available water: permanent swamps, seasonally inundated floodplains, and permanent high ground. The permanent swamps support a few species of wildlife adapted to the year-round aquatic conditions. Crocodiles and hippos, as well as sitatunga and lechwe (water-adapted ungulates) are the most notable permanent residents; savanna elephants and buffalo the most conspicuous transients. Several species of waterfowl, raptors, and songbirds are resident, but few wading and ground-dwelling birds are.

The more complex habitats of the lower delta contain the greatest numbers and highest diversity of wildlife: more than 20 species of ungulates, ranging from the dainty, 11-pound steenbok to the three-ton elephant, and scores of species of wading, perching, and ground-dwelling birds, and waterfowl. Many of the ungulate species migrate into the area in the middle of the dry season just before the floods, and remain there until the next rainy season lures them away. About half of the more than 400 species of birds recorded from the Okavango Delta are migrants residing there for only part of the year. Surprisingly, reptiles and amphibians are nowhere abundant, and the fish fauna is equally scarce, perhaps due to the frequent flooding.

During peak flooding, few animals graze on the floodplain except for lechwe and sitatunga, which browse grass stems that break the water's surface. Most herbivores feed on the edges between woodland and grassland, venturing into floodplains only when the water begins to recede. Warthogs, wildebeest, zebras, buffalo, reedbuck,

THE PERMANENT SANTANTADEBE CHANNEL IN THE LOWER DELTA. THE VEGETATION LINING THE CHANNELS CONSISTS OF VAST, TANGLED MATS OF PAPYRUS AND GRASSES.

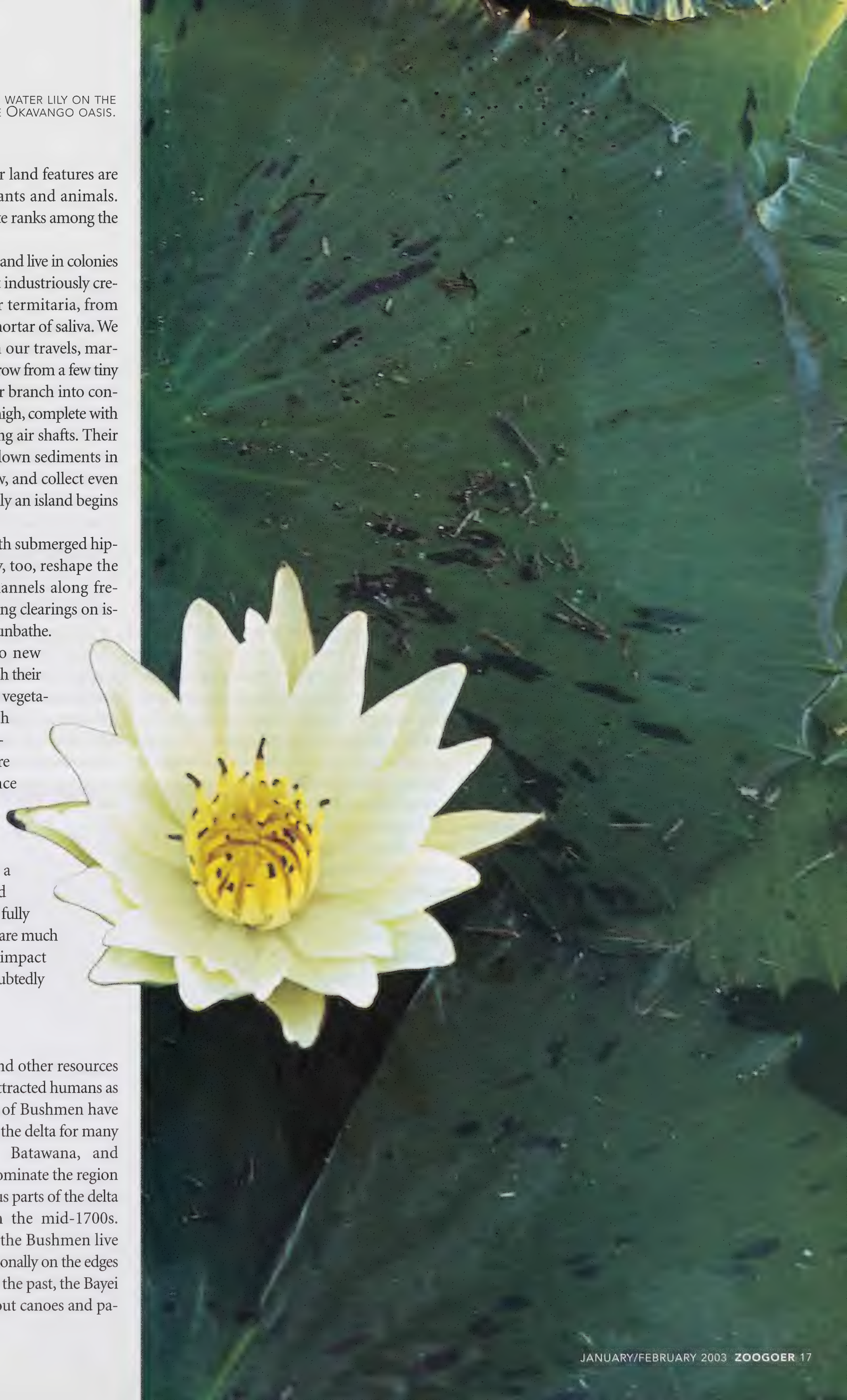
bushbuck, kudu, impala, giraffes, and steenbok all follow this pattern. Elephants, hippos, and crocodiles, impervious to the trepidations of flooded areas, are ubiquitous. With large numbers of ungulates attracting predators wherever they go, it's easy to spot lions, spotted hyenas, leopards, cheetahs, wild dogs, and jackals stalking the floodplains. Many small carnivores, including servals, caracals, wildcats, several species of mon gooses, civets, and genets, bat-eared foxes, ratels, aardwolves, and brown hyenas, feed on a smorgasbord of animal matter ranging from insects and small vertebrates to carrion.

Our days were anything but routine. Thanks to daily sightings of new species, each night's truncated sleep was bearable. Soon, our daily rhythm was nearly in synch with the world around us, and we began to feel a part of the interplay between the wildlife and their environment. We were also gaining insight into how close to the edge life here was. Every creature was living by the same harsh rule: Find the next meal soon and avoid being somebody else's. Our own increasing preoccupation with mealtimes reinforced the concept that what was happening around us was largely about nutrient flow.

THE MORE COMPLEX HABITATS OF THE LOWER DELTA CONTAIN THE GREATEST NUMBERS AND HIGHEST DIVERSITY OF WILDLIFE: MORE THAN 20 SPECIES OF UNGULATES, RANGING FROM THE DAINTY, 11-POUND STEENBOK TO THE THREE-TON ELEPHANT....

The Kalahari's ancient soils are extremely low in nutrients, and we pondered how so many large vertebrates could persist here. The explanation, it turns out, lies in the shifting migrations, the seasonal influx of nutrients via water and air, and in the way these nutrients are stored and released in the delta. Water entering the Okavango Delta system each year brings tons of suspended matter with it, and winds from the Kalahari bring tons of dust, blown in every year from the surrounding desert sands. Most of this becomes suspended in the water and moves with the floods. As the waters move ever more slowly through the fan, solids settle out as nutrient-bearing sediments. Particularly heavy sedimentation in the slow-moving channels of the middle and lower reaches creates habitats for papyrus, which forms dense, floating mats where sedges, grasses, and small plants can grow.

The Okavango's terrestrial systems are also in perpetual flux, and new land areas emerge constantly. Earth movements continue to bend and twist the terrain, creating major features, such as the permanent sandveld tongues of the upper



A DAY-BLOOMING WATER LILY ON THE WATERS OF THE OKAVANGO OASIS.

delta. But most of the smaller land features are created by the actions of plants and animals. Among these, the lowly termite ranks among the major architects of change.

Termites eat woody matter and live in colonies of millions of individuals that industriously create large conical mounds, or termitaria, from sand, dirt, dust, and a gluey mortar of saliva. We saw many huge termitaria in our travels, marvelling at what takes years to grow from a few tiny parent cells on a fallen twig or branch into conical concretions several yards high, complete with galleries, nurseries, and cooling air shafts. Their exteriors accumulate wind-blown sediments in which plants germinate, grow, and collect even more sediments until gradually an island begins to form.

A few close encounters with submerged hippopotami revealed that they, too, reshape the habitat by dredging new channels along frequently used paths and creating clearings on islands where they forage and sunbathe. Elephants also contribute to new channel formation as they crush their way through floating mats of vegetation while foraging. Both species, along with the plentiful and peripatetic baboons, are also important long-distance seed dispersers. Hippos and crocodiles, once superabundant throughout the Okavango, were hunted on a massive scale for their meat and hides in the mid-1900s. While fully protected now, their numbers are much lower than before, and their impact on channel formation is undoubtedly much reduced.

HUMAN IMPACT

Not surprisingly, the water and other resources of the Okavango Delta have attracted humans as well as wildlife. Small bands of Bushmen have probably lived in and around the delta for many centuries, but the Bayei, Batawana, and Hambukushu people, who dominate the region today, began colonizing various parts of the delta from surrounding areas in the mid-1700s. Nomadic hunter-gatherers, the Bushmen live mainly in the desert and occasionally on the edges of the delta and its islands. In the past, the Bayei hunted and fished from dugout canoes and pa-

DESPITE THEIR GREAT DISPARITY IN SIZE, ELEPHANTS AND TERMITES ARE THE TWO MOST IMPORTANT AGENTS OF LANDSCAPE CHANGE IN THE DELTA.

pyrus boats, while the Batawana and Hambukushu raised crops and livestock. Today, education and the mixing of different populations in multicultural communities have made the distinctions between these groups much less clear. All tend to practice mixed subsistence strategies of cultivation, fishing, hunting, collecting wild-plant foods, and cattle and goat herding.

Westerners were late arrivals. David Livingstone, the first European to visit the Okavango, was drawn there by stories of a great lake in the middle of the desert. He reached Lake Ngami and the edge of the Okavango in 1849, then left believing that he had discovered a string of lakes fed by snowmelt from distant, unseen mountains. In 1853, Western hunter Charles Anderson penetrated the Okavango and sensed its true extent and nature. "On every side, as far as the eye could reach, lay stretched a sea of freshwater," he wrote, "in many places concealed from sight by a covering of reeds and rushes of every shade and hue."

In the following years, many Europeans traveled to the region, mostly to extract its treasures. In 1867, hunters killed an estimated 20,000 elephants for their tusks and thousands of crocodiles for their hides and meat. Local people benefited little from this trade, but they did acquire firearms, which they used with alacrity to slaughter big game in unprecedented numbers. Within a few years of the musket's introduction, black and white rhinos had all but disappeared and buffalo and elephant numbers had plummeted.

In the 1920s and 1930s, administrators of the Ngamiland Protectorate, as this part of the Kalahari was then known, began eyeing the delta's water as both a commodity and a means of transportation. The first goal was clearing a permanent waterway through papyrus-clogged swamps to form a commercial-boat route between the panhandle and the growing commercial center of Maun. In 1930, a contractor succeeded in opening up about 60 miles of channel, but failed in the larger mission of creating an open waterway because channels changed courses and closed behind him almost as quickly as he could open them up.

Undaunted by early failures, and spurred by the demands of growing human populations, administrators subsequently conceived endless schemes to clear, drain, extract, use, and tame the delta. Chronic water shortages around Maun have led to several attempts to dredge lower channels to increase the amount of water flowing through them. Unfortunately, this had the opposite effect of destabilizing flow and causing floodplains to dry out, rendering them useless for subsistence farming.

Diamond miners once proposed to take vast amounts of water for their operations, but fortunately found abundant groundwater nearby before they started. More recently, the Namibian Water Board has proposed to pipe about one percent of the Okavango River's annual flow to local agriculture and to Windhoek, Namibia's capital. In principle, this plan might qualify as sustainable development because removing this small amount of water wouldn't cause a shortage in Maun. However, extracting the water creates problems. Dams and weirs are likely to impound vast amounts of sediment, resulting in a cascade of negative consequences throughout the delta. Direct pumping may have less impact, but agricultural land adjacent to the river will require heavy applications of fertilizer to supplement the nutrient-poor soils. The high likelihood of large quantities of fertilizers being washed into the river threatens the entire aquatic system.

HIGH-END TOURISM BRINGS MUCH FOREIGN EXCHANGE TO BOTSWANA AND CONSIDERABLE REVENUE TO LOCAL COMMUNITIES. ITS ENVIRONMENT-FRIENDLY POLICIES HAVE BEEN CALLED A MODEL FOR ECOTOURISM.

SMOKE FROM GRASS FIRES CREATES SPECTACULAR SUNSETS. FIRE IS AS MUCH A PART OF THE DELTA'S ECOSYSTEM AS THE ANNUAL FLOODS AND MIGRATIONS.

In recent years, the Okavango's combination of land, water, abundant wildlife, and excellent tourist facilities, together with Botswana's political stability, have made the delta a popular ecotourism destination for people like us looking for the "real and unspoiled" Africa. About 75 percent of the delta is now included in the Moremi Game Reserve and is designated for either tourism development or wilderness. Tourist zones are confined to about 50 concessions leased to operators for five- or fifteen-year periods. Each concession may host no more than 24 clients at a time (many accommodate 12 or fewer), must demonstrate a capacity for local employment and community development, and must have near-zero impact on the environment. These conditions, and the logistics of operating luxury camps in a remote wilderness, make the Okavango wildlife-safari vacation an expensive proposition.

But ultimately, this strategy may have less impact on the ecosystem and its wildlife than the high-volume tourism found elsewhere in Africa and, in so doing, may be more likely to achieve the dual goals of sustainable revenue and conservation.

We were also aware that this was no wildlife utopia. Wildlife outside the delta's protected areas faces pressure from hunting and livestock rearing. The prevalence of the tsetse fly, which carries the protozoan that causes sleeping sickness in livestock and people, has until recently kept the cattle industry, Botswana's second highest earner of foreign exchange, out of the delta. Under pressure from the powerful cattlemen, however, the government is conducting a massive anti-tsetse fly spraying program in an effort to open up some areas to ranching. Conservationists are concerned that the insecticide being used may be toxic to many other insects, fish, and their various predators up the food chain, including humans. Moreover, eliminating the tsetse fly could open the entire delta to the commercial livestock industry and herald the beginning of the end for its wildlife.

EUROPEANS TRAVELED TO THE REGION, MOSTLY TO EXTRACT ITS TREASURES. IN 1867, HUNTERS KILLED AN ESTIMATED 20,000 ELEPHANTS FOR THEIR TUSKS AND THOUSANDS OF CROCODILES FOR THEIR HIDES AND MEAT.

There is good reason for this concern. Transmission of disease from wildlife to domestic animals has long been an issue in Botswana, and, in the 1950s, fences were erected to prevent domestic animals from coming into contact with wildlife. The fences have reduced disease transmission, but they also have fatally entangled many wild animals and blocked their traditional seasonal migrations to water and food. The government reported in 2000 that wildebeest, eland, and ostrich populations had declined significantly since the fences were erected, and warned that declining wildlife might adversely affect the tourist industry.

So it is that all-too-familiar conservation debates followed us to the heart of the Kalahari desert. For the moment, the Okavango seems to us reasonably secure, but the tenuous stream of tourist dollars may not be enough to meet the demands and temptations of a developing nation with a burgeoning population and pressing social problems. It occurred to us that we could substitute the word "Everglades" for "Okavango" and tell a surprisingly similar story of discovery, exploration, human population growth, conflicts over water, and disagreements between wildlife and livestock advocates. We wondered whether lessons learned half a world away might help maintain the Okavango as the special place that it is. Z

Miles Roberts is Deputy Head of the Department of Conservation Biology; Katherine Baldwin is a wildlife photographer and attorney at the Department of Justice; Palmer Graham is a freelance editor residing in Washington, D.C.

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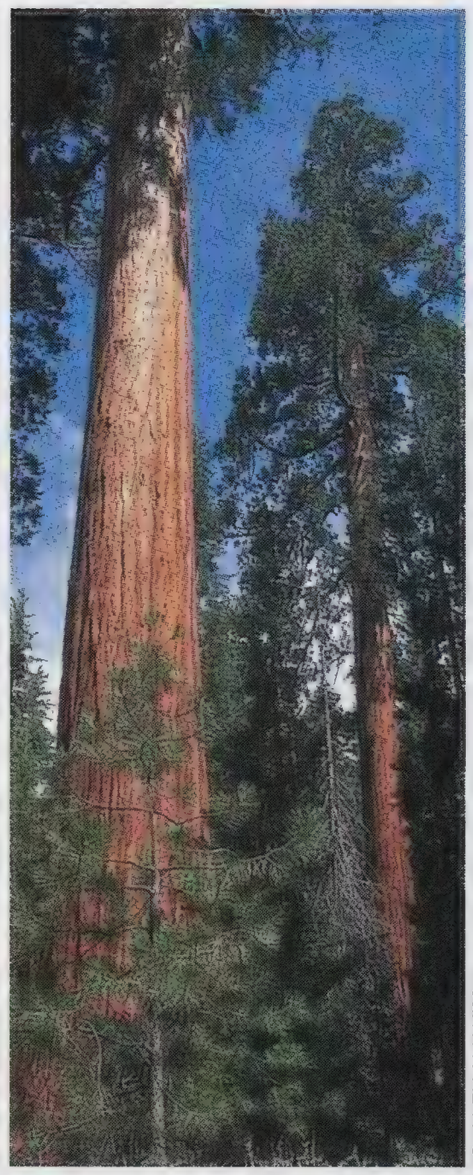
THE MARIPOSA GROVE LOCATED AT THE SOUTHERN END OF YOSEMITE NATIONAL PARK.



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Enviro Co

BY LYNN BLISS

When forest manager Bill Howe met the people hired to evaluate the environmental methods used to log the 94,000-acre Collins Almanor Forest in the early 1990s, he was skeptical and annoyed. Howe had been working in logging for the Collins Companies for nearly two decades, and knew that the company was devoted to preserving the softwood forest that is tucked into the Sierra Nevada mountains of northern California, which they do by selecting trees to be cut on a case-by-case basis. Unlike many other forestry companies,

THE HENRY DOWELL REDWOODS, CALIFORNIA.

THE COLLINS COMPANIES

TRUMAN COLLINS WAS THE THIRD GENERATION TO RUN THE COMPANY, AND WAS THE ONE WHO BEGAN SUSTAINED FOREST-MANAGEMENT PRACTICES (ALMANOR FOREST, 1941).

Collins didn't do clear-cut logging on its Almanor property, and trees ranged in age, size, and species throughout the dense woods.

But, the Collins Companies wanted to become the first U.S. logging company to receive Forest Stewardship Council (FSC) certification for its wood products. The council, an international nonprofit that certifies wood as coming from forests managed in an environmentally and socially responsible manner, requires logging companies seeking the FSC label to submit to an independent assessment of their forestry management. And that's how Howe came face to face with Robert Hrubes, a member of a team dispatched by Scientific Certification Systems of Emeryville, California, who had some suggestions for improvement. Howe had met Hrubes before, when he had attended state board of forestry meetings, and Hrubes had been working as a private forestry consultant for the Sierra Club and other environmental groups—the logging industry's equivalent of the Antichrist.

"He was always on the environmentalist side, always arguing against the industry, and there we were, hiring these people to come in and evaluate us," said Howe. "I didn't want anything to do with this guy."

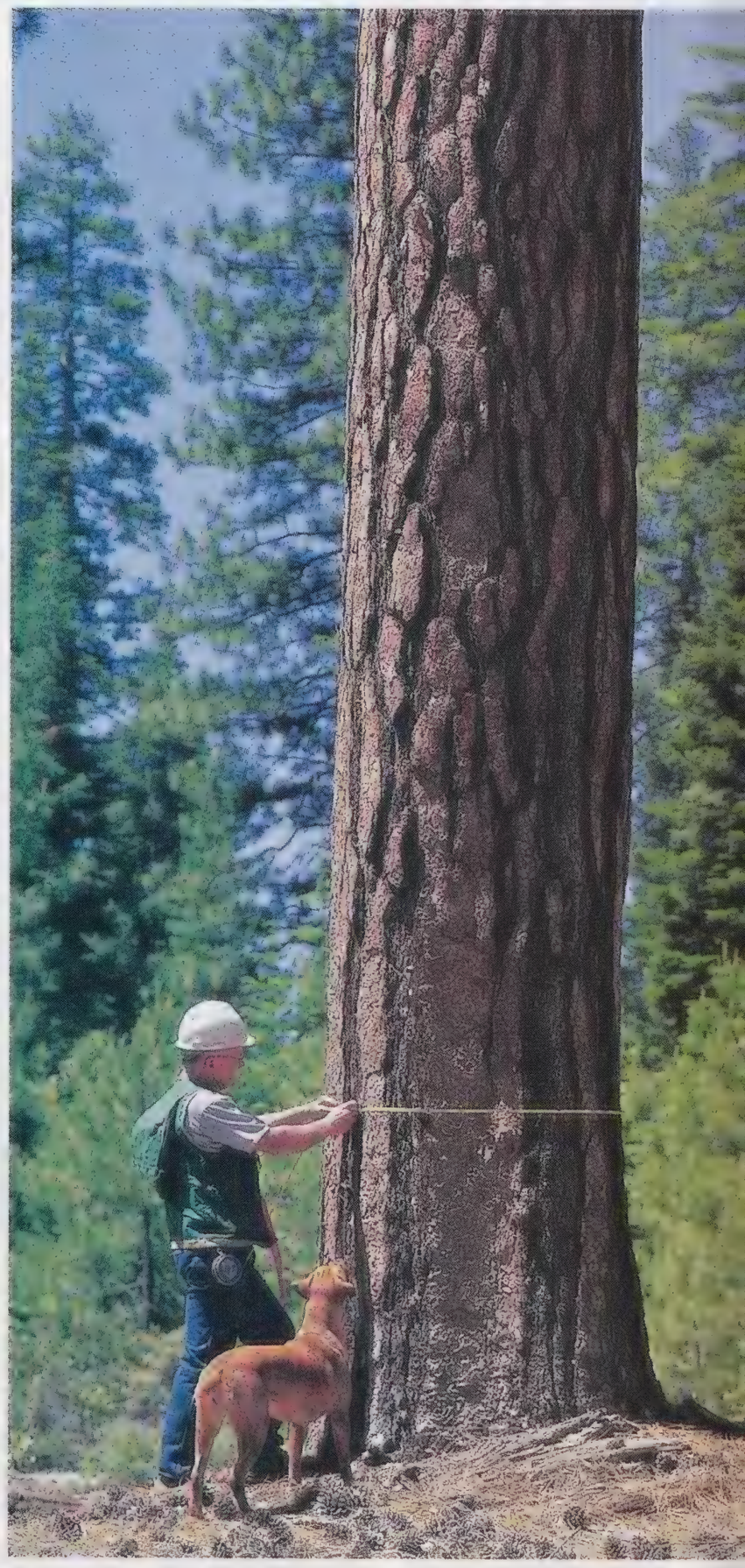
Today, a decade later, the Collins Companies has certified portions of two other forests in southern Oregon and the Allegheny Mountains of northern Pennsylvania, and Hrubes and Howe have put their differences behind them. Howe, now retired at age 57, became a strong supporter of FSC certification and went on to serve on the group's U.S. board. Hrubes, now a senior vice president at Scientific Certification Systems in the San Francisco Bay area, said that in the years since their initial meeting the two men became friendly.

"We weren't exactly welcomed with open arms. It was kind of tense in the beginning, because we were there only because of the corporate folks. He was openly hostile to the idea, or at least reluctantly going along," said Hrubes, who said that Collins had already been operating its forests in a very environmentally sound manner for decades, but needed to better document what it was doing to obtain certification. "And just a few short years later, he was jumping in hook, line, and sinker and becoming a true believer."

The Collins Companies was founded in the 19th century by a family that donated generously to what is now the United Methodist Church; a church-related trust still holds a minority stake in its timber holdings. But the firm's decision to become FSC certified wasn't motivated primarily by selfless concern for the environment and fellow man—executives thought they could boost business by getting their forests certified. Their hunch turned out to be correct: They were able to charge more for some FSC-certified products, and they were able to gain more market share from competitors on contracts that specified a preference for certified products.

"We did it because, frankly, we thought we could make some money. We thought we could differentiate ourselves from other companies. But in the process, senior management became true believers," said senior vice president Wade Mosby.

In many ways, what happened at Collins Companies parallels what is happening throughout corporate America with respect to environmental issues. It's usually the companies that are already employing sound environmental practices that decide to commit to higher standards, whether it involves certification or signing a voluntary promise with a nonprofit group to reduce emissions. Adopting those new standards can be a rocky process, as employees at all levels have to adapt to changes in the way they work. And most companies go that extra step not because their



BILL HOWE MEASURES FOREST GROWTH IN THE ALMANOR FOREST, CHESTER, CALIFORNIA.

executive suites and boardrooms are populated by ex-Greenpeace members, but because they see it as a valuable sales tool that will allow them to either sell more or sell at a higher price.

"I think what's happening is that more and more companies are realizing that this is good business. As much as we like to believe that companies are in this for the common good, what they're really looking at is the bottom line," said Peter Wilkes, a managing director at Innovest, a New York research firm that rates companies on their environmental sensitivity. "And at the end of the day, that microcosm of how a company is running its environmental programs gives investors a picture of how the company is running overall. It becomes a proxy for good management."

Investor response to good environmental policy, along with the potential for more profits, has nudged more and more publicly traded companies into greener pastures in recent years, but the level of commitment varies. The World Wildlife Fund and the Center for Energy and Climate Solutions has signed up six companies—including the Collins Companies, Johnson & Johnson, Nike, IBM, Polaroid, and construction-material supplier Lafarge North America—to join its Climate Savers pledge to reduce global warming gases. Another 38 corporations have joined the Business Environmental Leadership Council of the Pew Center on Global Climate Change, pledging to assess their domestic greenhouse-gas emissions and establish programs to reduce them, but without committing to set targets publicly.

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SUNSET OVER THE GREAT SMOKY MOUNTAINS NATIONAL PARK.

Even in traditionally earth-unfriendly industries, such as manufacturing, some companies have made significant strides. One corporation that has revamped nearly everything it does is a small Atlanta, Georgia-based carpet tile maker, known as Interface, Inc. The 29-year-old company has a lofty goal: It wants to run an environmentally sustainable business by 2020. To that end, it has reduced the scrap going to landfills by 80 percent, reduced its carbon dioxide emissions about 30 percent per unit of production at its largest business unit, and closed one-third of its outlet pipes and stacks at factories worldwide. It has reduced its reliance on fossil fuel by about one-third in the past seven years. Three of its factories use photovolteic energy, and four purchase certified green electricity. Eighty percent of the polyester manufactured by its Guilford of Maine unit and used in its fabrics comes from recycled plastic bottles. The company's founder and chairman, Ray Anderson, drives a Toyota Prius, a hybrid gas and electric car. The company contracts with American Forest, a nonprofit company, to plant a specified number of trees for every plane trip its employees take; since 1997, Interface has planted 30,000 trees to compensate for the CO_2 generated by business air travel.

"We're about a third of the way to our goal of eliminating waste," said Anderson. "Most of our raw materials are still petroleum derived, but we're gradually cutting that umbilical cord."

Anderson said that for the first 21 years of Interface's existence, the only thing he cared about was making sure the company complied with existing environmental regulations. Then, in 1994, he read Paul Hawken's *Ecology of Commerce*, and it changed his thinking.

As with the Collins Companies, there was some initial resistance to Anderson's vision. Dan Hendrix, who was the chief financial officer when Anderson declared his interest in going green, was concerned it would be too expensive to

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"HE WAS OPENLY HOSTILE TO THE IDEA, OR AT LEAST RELUCTANTLY GOING ALONG," SAID HRUBES. "...AND JUST A FEW SHORT YEARS LATER, HE WAS JUMPING IN HOOK, LINE, AND SINKER AND BECOMING A TRUE BELIEVER."

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HOW WILL INDUSTRY INFLUENCE NATURE IN THE FUTURE? THIS DUPONT PLANT IS NEAR CHARLESTON, WEST VIRGINIA.

THE COLLINS COMPANIES

MARKET FORCES

BY MELISSA BRADDOCK

In recent years, businesses have been realizing that cleaning up manufacturing processes and preventing pollution in the first place makes good business sense—it's profitable. Recent research shows that friendly environmental policies attract customers and enhance stock prices, suggesting advantages to good environmental management that extend beyond avoiding government fines. As a result, many businesses are looking toward sustainable practices to improve their bottom lines.

In one study, researchers Michael Russo and Paul Fouts followed the economic and environmental performance of 243 Fortune 500 companies for two years. They found that companies with superior environmental performance had higher returns on investment than competitors. Other studies have concluded that corporations that do well environmentally tend to be less risky investments than those with lower marks.

Applying stringent global environmental standards is more profitable for multinational corporations than defaulting to lower, poorly enforced local standards, according to a study published in the journal *Management Science*. Of the companies examined, firms choosing to employ their own strict global environmental standard in manufacturing abroad had an average value approximately $10.4 billion higher than those using less stringent local standards. Nearly 60% of the companies observed voluntarily adhere to more stringent global standards.

Customers are increasingly demanding products that not only perform their function but also strive to have the least environmental impact. Socially and environmentally screened investment funds are becoming more common and, significantly, many are outperforming traditional funds by large margins.

Market mechanisms and other financial incentives are powerful motivators, but government regulations are still needed to kick-start and supervise industry environmental policies. However, many researchers point out that legislation that is too strict or inflexible can hinder industry's attempts to find cost-effective environmental solutions.

Economist Richard Damania argues that harsh fines and penalties against polluters are the wrong way to approach the problem, and are likely to do more harm than good, particularly in developing nations where corruption is often rampant. Harsher penalties appear to encourage corruption and bribery, ultimately causing more environmental damage, says Damania. Thailand, for example, has stringent regulations and fines, yet remains badly polluted. Because bribery is so common, more stringent laws simply drive up the asking price for bribes. To afford them, companies step up production (and pollution). Likewise, raising the tax against pollution simply drives up the incentive to give out bribes and under-report emissions.

Problems with corruption are not limited to the Third World. A recent British report stated that Britain's high green taxes had boosted fuel smuggling and cross-border shopping, costing the Treasury $1.3 billion a year. On the other hand, high landfill taxes in Denmark have boosted construction-waste reuse from 12 to 82 percent in eight years, according to a report by the Worldwatch Institute.

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FUJIFILM—DESIGN FOR ENVIRONMENT

BY MELISSA BRADDOCK

People love the convenience of one-time-use cameras like Fujifilm's QuickSnap. But are these "throw away" cameras as bad for the environment as they initially seem?

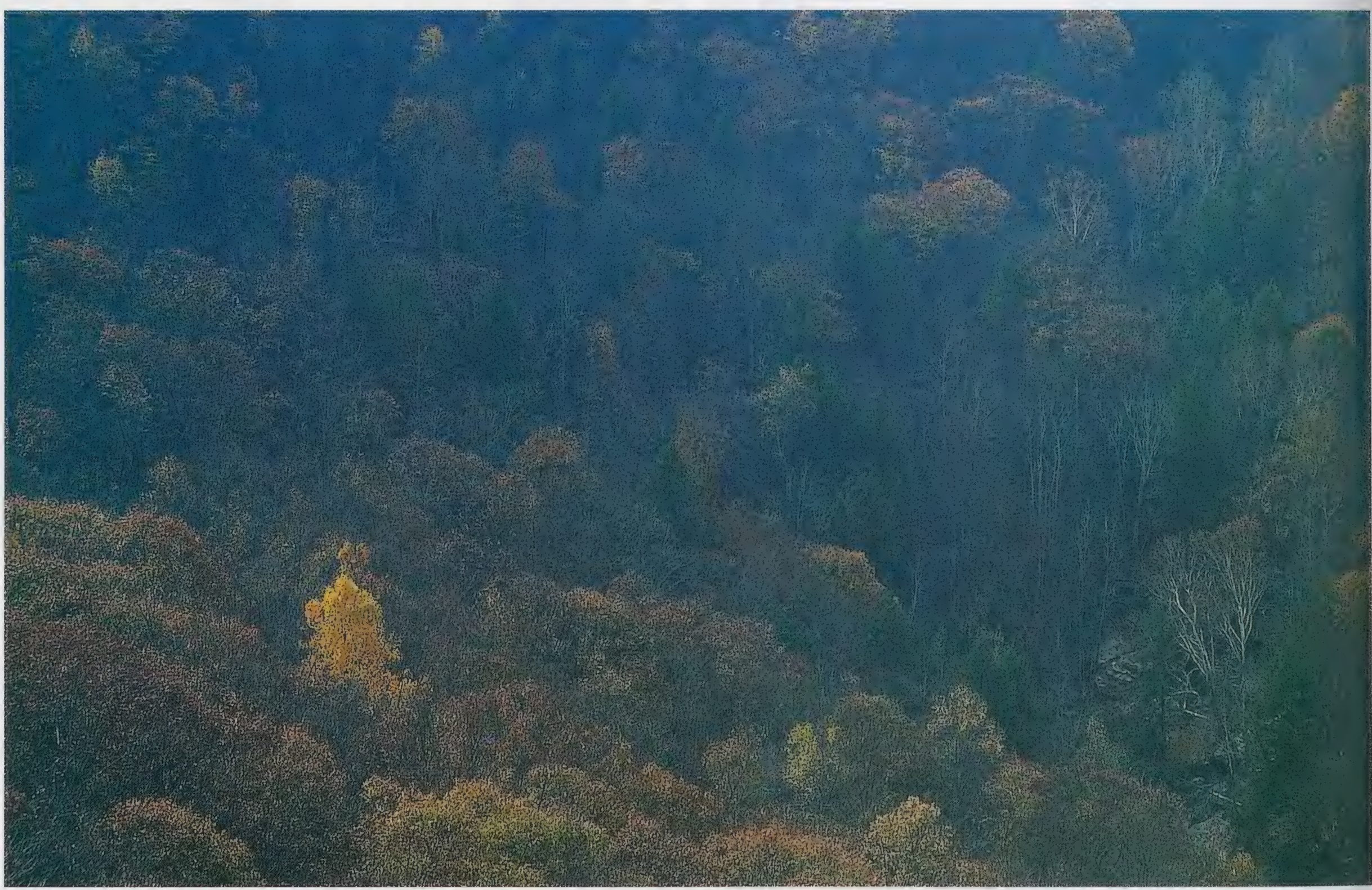
When they were first introduced, everything but the film was thrown away, but disposable cameras are no longer piling up in the world's waste dumps. Beginning in 1990, Fujifilm installed a revolutionary recycling system. In 1992, the company went back to the drawing board, redesigning the camera so that each part could be reused as is, or remade into raw material to be used again. The entire recycling process has been automated. Plastic covers are reduced to small pellets to be molded into new parts. Lenses, bodies, and strobe units are incorporated into new cameras.

In recent years, the introduction of lighter, more compact models has led to a reduction in resource use, while new construction methods and standardized parts have raised the level of reuse and recycling. Currently, 99% by weight of components are reused or recycled within the QuickSnap manufacturing cycle.

Fujifilm has accomplished 100% recycling of waste at six production and research sites, and aims to recycle all waste for its Japanese factories and research facilities in the near future, eliminating incineration and landfill use!

The QuickSnap camera is a part of Fujifilm's "Design for Environment" program, which is intended to incorporate environmental awareness, reuse, and recycling directly into product development in order to reduce the impact of products and packaging

In order to address complex environmental issues from a long-term perspective, "design for environment" policies are being adopted by more and more companies around the world. The European Union has recently circulated a legislative proposal setting ecodesign requirements and minimum energy efficiency standards for consumer appliances. Aimed at curbing Europe's energy consumption, the legislation may include minimums for recycled content and strict limits on the consumption of resources by factories.



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FORESTED SLOPES ALONG THE NEW RIVER IN WEST VIRGINIA.

adopt environmental goals beyond what was legally required.

"I was a pretty big skeptic of it. I said all right, but it can't cost us money," said Hendrix, now president and CEO. "The whole culture at that time was "We're trying to cut costs." Ray said it would take a while to change the culture, and it really did."

David Oakey, president of David Oakey Designs in LaGrange, Georgia, was enlisted by Interface to design a carpet tile that would incorporate elements of biomimickry, or using design principles found in nature. Oakey came up with Entropy, a pattern that doesn't require each tile to exactly match the next. The result is less waste when the tiles are cut and installed, and faster installation by workers who no longer have to worry about matching the pattern. Entropy has quickly become Interface's top-selling product.

"Nature doesn't make things perfect. There is no such thing as a solid-color leaf or stone," said Oakey. "If nature were going to design carpet tile, every tile would look different as far as its color and design. Which is completely opposite of what we've been trying to do for decades."

There's no question that the measures taken have benefited Interface's bottom line. By eliminating waste, the company has added $185 million to its operating income over the past seven years. It has been able to win more contracts from architects and designers, who often specify that they prefer to use environmentally sensitive products.

"NATURE DOESN'T MAKE THINGS PERFECT. THERE IS NO SUCH THING AS A SOLID-COLOR LEAF OR STONE,"

Herman Miller, Inc., a Zeeland, Michigan-based manufacturer of office furniture, has also made strides to reduce its environmental footprint, and in the process has knocked $1 million a year off its energy bill. It has set goals to reduce the energy it uses, the hazardous waste it produces, and the volatile chemicals it uses. A founding member of the U.S. Green Buildings Council, Herman Miller's manufacturing plant in western Michigan burns the company's own waste in a heat-recovery boiler, diverting 13,000 tons of waste from landfills each year and heating and cooling the entire plant. The company has developed a system of returnable packaging for its suppliers, so that materials are delivered in reusable bins that are sent back to be refilled again, rather than being tossed out. To reduce the waste involved in packaging products that it delivers to customers, Herman Miller ships about half of its chairs wrapped in the same blankets that commercial furniture movers use, which can be re-used.

"It's good business for everybody," said Paul Murray, the company's corporate environmental affairs manager. "The end user doesn't have to deal with all that packaging, and we like it because it saves us money."

As corporate America begins to realize the benefits of going green, is it possible that the U.S. could some day reach a point where companies like the Collins Companies, Interface, and Herman Miller outnumber those that are indifferent to the environment? Environmentalists aren't so sure, particularly in the wake of a report from the Ford Motor Company in August. The Detroit automaker, previously praised for the progressive outlook of its leader, William Clay Ford, Jr., and the goals it had set to reduce climate change, said it couldn't commit to any major environmental programs for the next several years. Difficult business conditions make meeting previous green promises harder to achieve than Ford first thought, although the company doesn't plan to abandon its goals, the report said.

Matt Arnold, a senior fellow at the World Resources Institute, said more companies are waking up to green issues and beginning to consider changing the way they operate. But he believes the U.S. needs better public policy to reinforce good environmental behavior by corporations, primarily through incentives to companies that combat issues like global warming. It also wouldn't hurt for political leaders to funnel more subsidies to industries like alternative energy and organic farming, he said. In the meantime, it will take a lot more business leaders to shift the balance toward the environment, citing the "jellyfish" reaction that many executivesexhibit when confronted about environmental issues.

"They're the hand-wringers who say, 'Gee, I wish we could do the right thing, but we can't. It's cheap to pollute, the customer won't pay the price to clean up, and Wall Street will beat us up.' So we can't do anything other than float in the water," said Arnold. "I feel like there's a little bit of that out there now."

—Lynn Bliss is a freelance writer who lives in Takoma Park.

THE COLLINS COMPANIES

THE COLLINS COMPANIES

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CLOCKWISE FROM LEFT: A VIEW OF THE ALMANOR FOREST FROM MOSQUITO RIDGE SHOWS FOREST THAT HAS BEEN LOGGED BY COLLINS FIVE TIMES IN THE LAST 50 YEARS.

A RESIDENCE BUILT WITH COLLINS' FSC-CERTIFIED CEDAR AND PINE.

STRING LAKE IN GRAND TETON NATIONAL PARK.

ROCK CREEK IN THE DISTRICT'S OWN NATIONAL PARK.

GREEN INVESTING

BY LYNN BLISS

Individuals who want to purchase shares of environmentally responsible companies need to delve deeper than the average investor when evaluating their choices. Nearly every major U.S. company will claim it is interested in preserving the environment, but separating those that act on their convictions from those that pay lip service to being green requires perseverance.

Environmentalists say one key issue to consider is whether a company has clearly defined goals, such as reduction of global-warming gases, and whether it reports regularly to investors on its progress in reducing them. Corporations that make vague statements about wanting to cut CO_2 emissions but don't set a target or timeline aren't as committed as those that do. Investors should also take a hard look at the certification labels that some companies tout. Achieving environmental certification for a product from an independent, third-party organization is meaningful, but some industries have also developed their own watered-down certification labels that don't carry much weight among environmentalists.

"One of the things you can look at in terms of true greenness is whether they have been truly leaders in their sectors. Have they found some innovative approaches to the way business is conducted in their segment of the economy, and has that had a ripple effect on other segments of the industry?" says Bruce Cabarle, director of the global-forest program at the World Wildlife Fund. "I think that's something that's true in the case of the Collins Companies. They were one of the first companies in the U.S. to have their forest management practices independently certified. And at the time they did that, they were largely ridiculed in the forest-products industry. Today, you'd be hard pressed to find a forest-product company not in the process of getting certified by some standard." There are various Internet sites devoted to environmental-investing issues, but two of the best are the Social Investment Forum (www.socialinvest.org), a national nonprofit that promotes socially responsible investing, and SocialFunds.com (www.socialfunds.com), a personal-finance site devoted to socially responsible investing. The GreenMoney Journal (www.greenmoneyjournal.com) also covers environmentally responsible investment issues at its web site.

For investors who don't have the time or inclination to research every stock they own, there are mutual-fund companies that will do the grunt work. Progressive Investment Management's Portfolio 21 (www.portfolio21.com) purchases only companies that are committed to environmental sustainability. The New Alternatives Fund (www.newalternativesfund.com) concentrates its investments in renewable energy and the environment. Green Century Funds (www.greencentury.com) invests in companies that it deems environmentally responsible, and is considered a strong investor advocate, lobbying shareholders to vote on issues at annual meetings ranging from drilling in the Arctic National Wildlife Refuge to the use of genetically modified ingredients in food.

BOOKS, NATURALLY

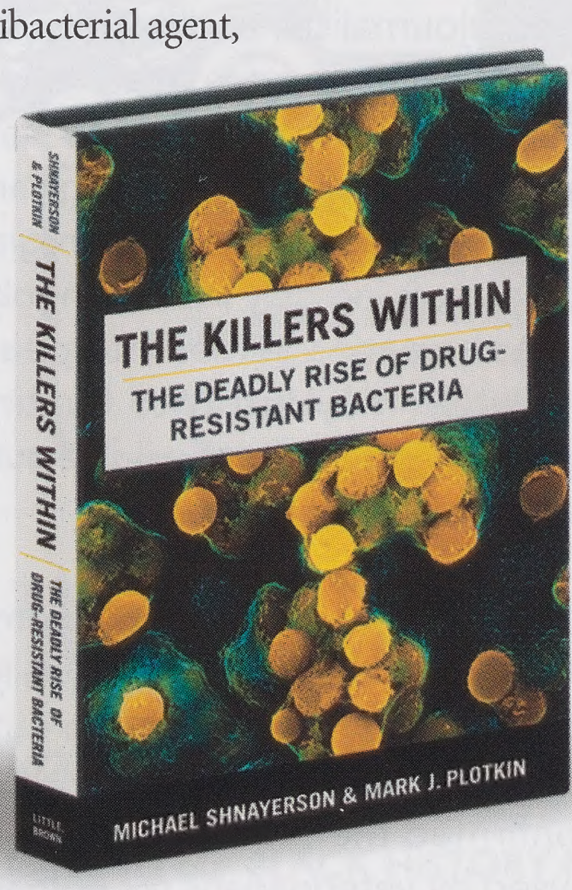
The Killers Within: The Deadly Rise of Drug-Resistant Bacteria.
Michael Shnayerson and Mark J. Plotkin. 2002. Little, Brown and Company, Boston. 328 pp., clothbound. $24.95.

A good friend recently died in one of our most dangerous places: a hospital. He was admitted to the prestigious hospital with an aneurysm but with treatment was soon recovering. Then he acquired a bacterial staph infection. It killed him.

To people like me who grew up after modern antibiotics were developed during World War II, this is shocking. Surely a course of some antibiotic should have cured this infection; to die of it in a hospital, while under the care of nurses and doctors, seemed impossible. But many hospitals harbor deadly drug-resistant strains of *Staphylococcus, Streptococcus*, and other bacteria, which in recent years have killed an estimated 40,000 people annually in the U.S. Moreover, drug-resistant bacteria are turning up in daycare centers, schools, and homes. Many medical scientists believe that the "golden age" of antibiotics is over and our ability to win the battle against bacterial diseases is about to disappear.

The Killers Within offers a litany of case studies of reasonably healthy people who have died, or nearly so, from bacterial infections that would not respond to any antibiotic. Sadly, we know how it got to this state and how to begin to address it, but too few people are listening. Shnayerson and Plotkin hope to raise the profile of the problem so more of us will demand policies and programs to solve it. At the very least, those little inclined to activism will be moved to change their personal practices and contribute to the solution.

Plotkin is the renowned ethnobotanist and best-selling author of *The Shaman's Apprentice* and other books on the search for new drugs in the world's vanishing natural habitats. You may wonder, as I and many others who know his work did, why an ethnobotanist would be writing about drug-resistant bacteria. You may also wonder why I would be reviewing this book. For one thing, scientists must continue to look to nature for new antibiotics, so the specter of killer bugs adds urgency to efforts to conserve wildlife and wild lands, and may create a new constituency for conservation among people who are indifferent to the plights of species other than our own. In one short, fascinating episode in this book, the authors describe the search for new weapons against bacteria in the saliva and blood of Komodo dragons, creatures admired only by ardent animal-lovers. The Komodo dragon often eats rotted carrion and as a result its mouth is a bacterial megalopolis. If a dragon's bite doesn't kill a deer or pig outright, the animal will die of a bloodstream infection within a few days. That the dragons can live with this deadly bacteria suggested that they possess some antibacterial agent, and, indeed, after a dangerous adventure to collect saliva and blood samples from wild dragons, researchers have isolated a promising antibiotic peptide.



Contrary to the complaints that environmentalists and conservationists care more about tigers and trees than about humans, people adopt these roles because they are concerned about our quality of life, and that of our children. The proliferation of deadly super bugs is an environmental problem of our own making, no different from water and air pollution that affect our health, or deforestation that contributes to global climate change, or the extinction of species that leaves us poorer in spirit.

Another subtext throughout this book is that people should know better. At the Zoo, we are devoted to improving biological literacy, and many of our exhibits explore themes of evolution and adaptation through natural selection—a fundamental principle of biology that we ignore or misunderstand at our peril. This principle predicts the rise of bacteria resistant to antibiotics. Scientists think of the relationship between a predator (whether a bacteria or a bear) and its prey as an arm's race. As prey evolve to outwit or outrun their predators, the predators evolve to outwit or outrun their prey. If one doesn't evolve, it will likely go extinct. We and our bacteria are in an arm's race. But while our bacteria evolve quickly, we reproduce too slowly to keep up. In the 20 years since a new class of antibiotics was developed—roughly one human generation—most bacteria have gone through about 100,000 generations. Instead, we have to be smart and change our behavior to defend ourselves.

A variety of factors have brought us to the verge of a "post-antibiotic world." One is the overprescription of antibiotics. Another is prescribing antibiotics for viral infections, when doctors, the authors write, "might as well be prescribing M&Ms." Patients demand drugs when they are sick and doctors are reluctant to say no. Another is our tendency not to finish prescriptions—when we take half the dosage, we kill the least resistant bacteria, leaving the strong to survive. Another is the routine, massive, and uncontrolled use of antibiotics to promote rapid growth in livestock. We eat antibiotics in our meat and drink them in our milk. This use has led to resistant bacteria in livestock, some of which have passed to people. According to the authors, two food-borne bacteria account for 75 percent of food-related deaths in the U.S., and "many if not most of those deaths involved multi-drug resistant strains." And—surprisingly—the use of antibacterial soaps is counterproductive, killing harmless strains and leaving room for the dangerous ones to grow!

The good news is that all of these problems can be solved, mostly through education, because it is up to each of us to take all our medicine, not demand "M&M" prescriptions, and press our food producers to reduce or eliminate antibiotics in livestock feed (or eat organic). This book should help wake people up.

The Killers Within reads like murder mystery, and you'll find it hard to put down because you'll want to know how the scientist-detectives will solve the case. Unfortunately, there is no tidy revelation of a culprit who can be prosecuted and put away. We are all implicated in the crisis, and ignoring it is potentially murder and suicide.

—*Susan Lumpkin*

BIO ALMANAC

A recent research expedition in Angola returned with good news about the giant sable antelope (*Hippotragus niger varian*)—it has survived. Nearly 30 years of civil war has ravaged Angola in southwestern Africa and wiped out most of the country's once-abundant wildlife.

Giant sable, the largest subspecies of the common sable antelope, dwell only in the open woodlands of northern Angola and are a revered national symbol. An image of a male giant sable with elegant five-foot-long horns arcing over its back can be found on Angolan postage stamps, passports, and currency.

National Zoo research associate Richard Estes recently joined South African and American wildlife experts, photojournalists, and military and government officials for a two-week expedition in search of the species. After two days of fruitless helicopter searches, a quieter, on-foot expedition into Cangandala National Park resulted in fleeting sightings of several giant sable, as well as droppings and signs of feeding.

This is the first confirmed sighting since 1982, when giant sable populations were estimated at 1,000 to 2,000 animals, living only in two Angolan reserves and the corridor connecting them. Yet, even as the nation settles into peace, starving Angolans who live within the protected reserves may resort to hunting the antelope for food. Researchers warn that Angolan and international wildlife authorities need to act rapidly to protect the critically endangered animal.

JESSIE COHEN / NZP

Workers at a Florida landfill last summer found a dead American bald eagle (*Haliaeetus leucocephalus*) lying amid the trash. Next to it was the body of its last meal—a euthanized pet cat. Scientists at the U.S. Fish & Wildlife Service's Wildlife Forensic Laboratory later confirmed the presence of sodium pentobarbitol, a drug widely used by veterinarians for euthanasia and anesthesia, in the eagle's crop contents and liver.

Such incidents occur sporadically across the nation, according to the U.S. Fish & Wildlife Service. Animals euthanized at veterinary clinics, animal shelters, or private farms can easily contain enough residual poison to kill eagles, vultures, and other wild scavengers if the carcasses are not properly buried or burned. Scavengers that are not killed directly can also become intoxicated or anesthetized by the drug, making them easy prey for predators.

Pentobarbitol in a decomposing carcass may retain the ability to kill for some time, possibly even throughout the winter in cold climates. The drug's concentration is generally highest in the liver and spleen, organs that eagles favor for food.

Veterinarians, livestock owners, and others responsible for the improper disposal of animal carcasses leading to the poisoning of protected species may be prosecuted under one or more federal laws, including the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Endangered Species Act.

>> MORE NEWS

The Chesapeake Bay, the nation's largest estuary, isn't getting any healthier, according to an annual report from the Chesapeake Bay Foundation. The bay rated a 27 out of 100 on the report's health index for 2002—far short of the organization's goal of a rating of 40 by 2010.

The condition of the bay has remained virtually unchanged for the past five years, despite a 2000 agreement between the Environmental Protection Agency (EPA); the governors of Maryland, Pennsylvania, and Virginia; and the mayor of Washington, D.C., to clean up the bay and get it off the EPA's list of impaired waters. That agreement provided no funds for the estimated $20 billion cleanup that is needed.

The leading threat to the health of the Chesapeake Bay is nitrogen pollution from farmland runoff, sewage treatment plants, and other sources. Other threats include urban sprawl, toxic pollution, and poor fishery management.

On a more positive note, the National Oceanic and Atmospheric Administration recently awarded more than $2.8 million to study and conserve Chesapeake Bay fisheries, funding studies that will acquire valuable information about local species and ecosystem-based fisheries management. The NOAA also awarded four grants totaling $250,000 to provide Chesapeake Bay-area teachers with hands-on environmental education resources about the bay's watershed environment.

—*Melissa Braddock,* ZooGoer *Intern*

>> WHAT'S IN A NAME

"Quite a lot," according to the Patrons of Biodiversity, or BIOPAT, a German non-profit organization that accepts donations in exchange for the opportunity to choose the name of a newly identified species. The group works with a variety of organizations to promote the importance of biodiversity, and scientists who relinquish their right to name species they've found to BIOPAT. The naming service is a fundraising tool, giving people the opportunity to contribute their name to the annals of science, as well as put their money behind the group's mission. The minimum donation is about $2,600, for which the group sends a certificate and a receipt for your charitable (and potentially tax-deductable) donations.

Currently, there is a new bird species available for naming; it's from tyrant flycatcher family (Tyrannidae). Known informally as the "Yungas Tyrannulet," it was first observed in 1990 by the late Ted Parker. Additionally, there is a variety of new moth species now available for naming, as well as frogs, flowers, and two insects currently going by "Big Mac" and "Spiderman."

You can find BIOPAT at www.biopat.de.

—*Brendan Horton*

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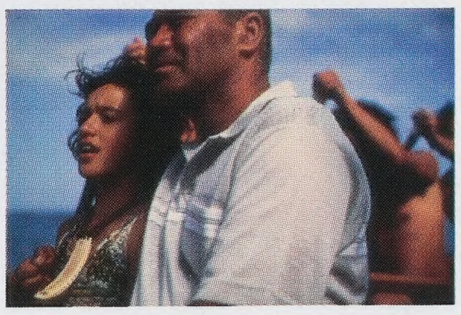

Film still from *Whale Rider* (Niki Caro, 2002, 105 mins., New Zealand)

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